is little to choose on the merit of distance. On the other hand the speed of signalling by the "Marconi" system is limited to something like twelve words a minute, and we must conclude that it is this circumstance that handicaps the method. It is also probable that "coherer" systems are at present too susceptible to mechanical and fortuitous electrical tremors for the ordeal of a telegraph office, but in the absence of evidence it is perhaps scarcely fair to draw comparisons in this regard. According to the *Times* of Monday, the 9th inst., arrangements are being made under the direction of Signor Marconi at the South Foreland lighthouse, and aboard the South Goodwin light-ship, for a series of experiments with his apparatus. It is stated that if the system is found satisfactory it will forthwith be adopted between those points—the distance between them is about three miles.

Two articles in the *Electrician* of November 12, 1897, one by Dr. Lodge[1] and the other by Mr. A. C. Brown, should be referred to as indicating the extent of the work done and the hopefulness of the votaries of "coherer" systems at that time. Later developments of the "coherer" system, particularly in the matter of syntony and the best arrangement of contacts, are dealt with by Dr. Lodge in a communication to the Physical Society of January 21, 1898, an account of which appeared in NATURE in February 1898. The possibility of individualising signals by syntony on Dr. Lodge's system is discussed in an excellent article in the *Electrical Review* of August 19, 1898, which is prefaced by some remarks that already show the weak points of "coherer" systems. Messages had then been sent by Marconi over a distance of about sixteen miles, and received in "dot and dash" on the Morse ribbon at a rate of something under twelve words a minute; but it had been found in practice that the principle of resonance could not be applied with sufficient effect to ensure that messages should be recorded only by a single selected receiver. Whether the later more elaborate methods of syntony for "coherer" systems, proposed by Dr. Lodge, have justified themselves in practice is not yet known, but it is a significant fact that Dr. Lodge's most recent paper on the subject of space-telegraphy makes a distinct departure from the "coherer" system, and contains no account of experiments in the direction of syntonised receivers used in this particular way.

In 1898, experiments as to the mysterious connection between "coherers" and photo-electric phenomena made little progress towards a practical system of telegraphy. In the hands of Prof. Minchin these experiments, at the outset, showed great promise; they gave us the "collecting wire" which, protruding into space, acts as a "feeler" for Hertz waves, but at present they remain as toys of the laboratory. The so-called "Lichtelektrische Telegraphie" of Prof. Zickler, of which a very good account is given in the *Elektrotechnische Rundshau*, No. 21, pp. 232-233, 1898, is more pretentious as a means of signalling. Prof. Zickler makes use of an old discovery, due to Hertz, that ultra-violet light is able to reduce the spark-resisting power of an air-gap. He directs a beam of light from an arc lamp, provided with a shutter, upon the extended spark-gap of an induction coil, and by opening and closing the shutter causes sparks to pass at the gap at corresponding intervals of time. These sparks affect a "coherer" circuit, and signalling is rendered possible. Such experiments are very attractive from a purely scientific standpoint, but it is not easy to see the advantage of this method as compared to the ordinary heliograph. Using the simplest form of apparatus, Prof. Zickler succeeded in signalling by this means across a space of two metres; and by the aid of an arc lamp that expended nearly two horse-power, and by the use of quartz lenses, that distance was extended to 200 metres. The speed of receiving the signals is not mentioned; the extreme limit is probably about twelve words a minute. He proposes to apply the system to lighthouses and to fortresses. We admit that such a system would be admirably suited for the purpose of warning our *foes* off dangerous parts of the British coasts; but for the purpose of warning our own or friendly ships, a surer means of communication must be adopted.

Comparing the various methods,[1] and keeping in mind that we are here concerned with a practical question for engineers, rather than with the scientific aspect of space-telegraphy, it would seem that the "coherer" systems as a whole are about to be cast aside, and that preference is to be given to alternate-current inductor systems for coast-telegraphs. If this is indeed to be the case, the problem is greatly simplified, and experiment resolves itself into the single task of finding the best design of apparatus for communicating between a moored light-ship and the shore by means of inductor coils. Dr. Lodge's paper on "Improvements in Magnetic Space Telegraphy" gives us what may be regarded as the academical aspect of that task; he describes a new receiving device for magnetic induction telegraphy, and he explains the method of putting it into practice. The principal feature of this device is the outcome of an electric resonance experiment first described in NATURE, vol. xli. p. 368, eight years ago—namely, the experiment of syntonic Leyden jars. Dr. Lodge now replaces the jars by condensers, and the "tuned circuits" take the form of horizontal coils of wire. The inducing coil is connected to an alternate-current dynamo, and the induced coil is connected to a train of telephone relays, the last of which is thus set into violent action at each received impulse. The paper includes the theory of two such circuits arranged in mutual syntony, and it is full of information and suggestions as to the proper course future experiment should take; the advantage of syntony is discussed, and the relative importance of conduction and induction is considered together with a detailed investigation of the theory of "detectors" for such a system.

The absorption-factor in the case of sea-water will probably be one of the first matters to be dealt with by experiment and theory in the present year. By the use of horizontal inductor coils, one on the light-ship and one ashore, Dr. Lodge avoids the practical difficulty; nevertheless the problem is sure to elicit his interest. Mr. Whitehead, holding tacitly to Maxwell's equations, deduces a law for the absorption-factor, and to this law Dr. Lodge takes exception. Maxwell supposed that the total current was made up of the polarisation current and the induction current; Mr. Whitehead assumes that the polarisation current may be neglected, and that provided the frequency is not comparable with that of light, no serious error can arise from that assumption. Do Maxwell's equations fail then for such a case? Dr. Lodge seemed unwilling to admit that they do fail; he suggested that Mr. Whitehead had written them down in a form that did not agree with Maxwell, and that Prof. J. J. Thomson had written them in yet another form. Mr. Whitehead now asks Dr. Lodge what is the right form? And that's how the matter stands.

ROLLO APPLEYARD.

THE FISHES OF TANGANYIKA AND OTHER GREAT LAKES.

THE first part of the fifteenth volume of the *Transactions* of the Zoological Society of London, which has just been issued, is devoted to a report by Mr. G. A. Boulenger, F.R.S., on the collection of fishes made by

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[1] By a slight error, Dr. Lodge there attributes an experiment on liquid "coherers" to Lord Rayleigh. This experiment was first described and shown by the present writer on March 26, 1897, at the Physical Society. A few weeks later it was *repeated* by Lord Rayleigh at the Royal Institution.

[1] For the various methods of space-telegraphy, see a paper by Dr. S. P. Thompson (*Soc. Arts Journal*, 46, pp. 453-460, 1898).

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Mr. J. E. S. Moore in Lake Tanganyika during his recent expedition to Eastern Africa. As Mr. Moore has shown in our columns (NATURE, vol. lviii. p. 404), there are two faunas in Lake Tanganyika, the normal freshwater, and what Mr. Moore proposes to call the "Halolimnic" group, the latter being evidently of marine origin. That this is the case has been conclusively shown by Mr. Moore's studies of the splendid collection of molluscs which he obtained in that lake. It would therefore be naturally expected that the results of the examination of Mr. Moore's fishes, which has been undertaken by Mr. Boulenger, would likewise show the presence in Lake Tanganyika of a certain number of "Halolimnic" or marine fishes. This, however, does not prove to be the case. Mr. Moore's fishes, Mr. Boulenger informs us, do not yield any such startling results as the mollusca and other invertebrates. The fishes of Tanganyika, though very novel and very remarkable, do not embrace any marine forms. This may be due, as Mr. Boulenger observes, either to the origin of the present fish-fauna not reaching as far back in time as that of the molluscs, or to the incompleteness of Mr. Moore's series. The latter explanation is probably the correct one, as Mr. Moore met with great difficulty in dredging in the deeper water of Tanganyika, only one fish having been obtained from a depth of about 400 feet. This (*Bathybates ferox*), although of a new genus and species, belongs to the widely-spread African family Cichlidæ.

Altogether, the fishes obtained by Mr. Moore in Lake Tanganyika are referred by Mr. Boulenger to thirty-five species, belonging to the families Serranidæ, Cichlidæ, Mastacembelidæ, Siluridæ, Cyprinidæ, Characinidæ, Cyprinodontidæ and Polypteridæ. It would thus seem that in general characters the Tanganyikan fish-fauna, so far as it has been yet ascertained, does not materially differ from the fish-faunas of the other great African lakes, but that most of the Tanganyikan species and many of the genera are distinct, the family Cichlidæ alone having furnished types of ten new genera in the present collection.

In his introductory remarks to the present memoir, Mr. Boulenger has taken the opportunity of putting together lists of the fishes already known to be found in Lake Nyasa, Lake Tanganyika, Lake Victoria and Lake Rudolph. From the first of these we are now acquainted with thirty-seven species, from the second with forty-three, from the third with only nineteen, and from the fourth (Lake Rudolph) with only nine. These lists, Mr. Boulenger points out, must be taken as giving a very inadequate idea of the piscian inhabitants of the great African lakes, owing to the manifest incompleteness of the collections upon which they are based. Of the other lakes nothing whatever, unfortunately, can be said at present, only one species of fish having been yet brought from the great Albert Nyanza. It is evident, therefore, that there is a fine field for the enterprising ichthyologist in the great African lakes.

PROFESSOR ALFREDO ANTUNES KANTHACK.

BY the death of Prof. Kanthack the science of pathology has lost one of its ablest and most indefatigable exponents, and the University of Cambridge, for the second time in less than fifteen months, a brilliant occupant of its chair of Pathology.

At the closing meeting of the Pathological Society, last summer, it was noticed by several of Prof. Kanthack's friends that he appeared to be less energetic and vigorous than usual. After this the work of the long vacation appears to have told upon his health so seriously, that even during the course of a short holiday it was remarked at the opening of the Pathological Laboratories at Liverpool that he still appeared to be far from well. In spite of this few were prepared to learn, about the middle of December, that Prof. Kanthack was suffering from a malignant growth, the symptoms of which had first been indicated by jaundice and severe abdominal pain—a diagnosis that was afterwards confirmed. He died on December 21, 1898.

Alfredo Antunes Kanthack was the second son of Emilio Kanthack, Pará, Brazil, and Victoria his wife, both born in Permambuco. He was born at Bahia on March 4, 1863, and spent the first few years of his life in Bahia and Ceará, Brazil. He was brought to Germany in 1869, being placed under the care of Pastor Hoppe of Artlenburg on the Elbe, father of the present Prof. Edmund Hoppe of Berlin. In 1870 he was sent to Hamburg, where he was first taught by a strict disciplinarian, "a tyrannical pedagogue but excellent teacher of elementary subjects." During this period he is described as "being by no means brilliant but extremely diligent." Early in 1875 he went to school in the Wandsbeck Gymnasium, near Hamburg. In 1876 he was transferred to the Gymnasium of another Prussian Government school at Lüneburg, and in 1878 to the Gymnasium at Gütersloh, where he greatly distinguished himself. In 1881 he came to Liverpool, where his parents were then residing, and continued his studies for a short time in the Shaw Street College (Classical Department). In 1882, after passing his University of London matriculation examination, he commenced his arts curriculum, and continued his studies in science and medicine under Mitchell Banks, Caton, Mott and other well-known teachers of the Liverpool medical school, graduating B.A. in 1884, B.Sc. in 1886, M.B. and B.S. (in each instance with honours), F.R.C.S. Lond. in 1888, and M.D. Lond. in 1892; whilst in 1897 he proceeded to the degree of M.A., and became a Fellow of the Royal College of Physicians, London. After completing his medical curriculum Dr. Kanthack, in 1889, proceeded to Berlin, and there, as part of the result of his studies under Virchow and Krause, he contributed an admirable paper to Virchow's *Archiv* on the histology of the larynx, a paper which at the time gave rise to a lively controversy, Dr. Kanthack maintaining his original thesis with marked ability and success. Whilst in Berlin, too, he worked under Koch, and here, as in the pathological laboratories, he attracted the attention and received the special encouragement of his teacher. Shortly after his return from Berlin, and probably as the result of an expression of opinion on the part of his teachers—Virchow and Koch—he was appointed one of the Special Commissioners along with the late Dr. Beaven Rake and Dr. Buckmaster, by a joint Committee of the Royal College of Physicians, the Royal College of Surgeons and the Executive Committee of the National Leprosy Fund, to investigate the prevalence, the pathology and the treatment of leprosy in India.

In 1891 Dr. Kanthack was appointed John Lucas Walker Scholar under the late Prof. Roy, and in succession to Dr. William Hunter. During the time that he held this scholarship in Cambridge, he published, along with Mr. Hardy, a paper on the wandering cell in the mammalia, in the *Journal of Physiology*, and a paper on the behaviour of wandering cells, in the *Proceedings* of the Royal Society, vol. lii. These papers are of special importance as indicating that, although thoroughly acquainted with Metschnikoff's work and all that that author had to advance in support of his phagocytic theory, Dr. Kanthack had made, during his stay in Germany, an accurate forecast of the destination to which the work that was being carried on in Germany by Koch's pupils

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